

Impact of APS Accelerator Complex on Science at 3-ID

- Bunch structure
- Bunch purity
- Bunch length
- Beam emittance
- Beam stability
- Undulator radiation damage
- Straight section length
- Top-up
- Specialized undulators

E. Alp, 15 March 02, APS

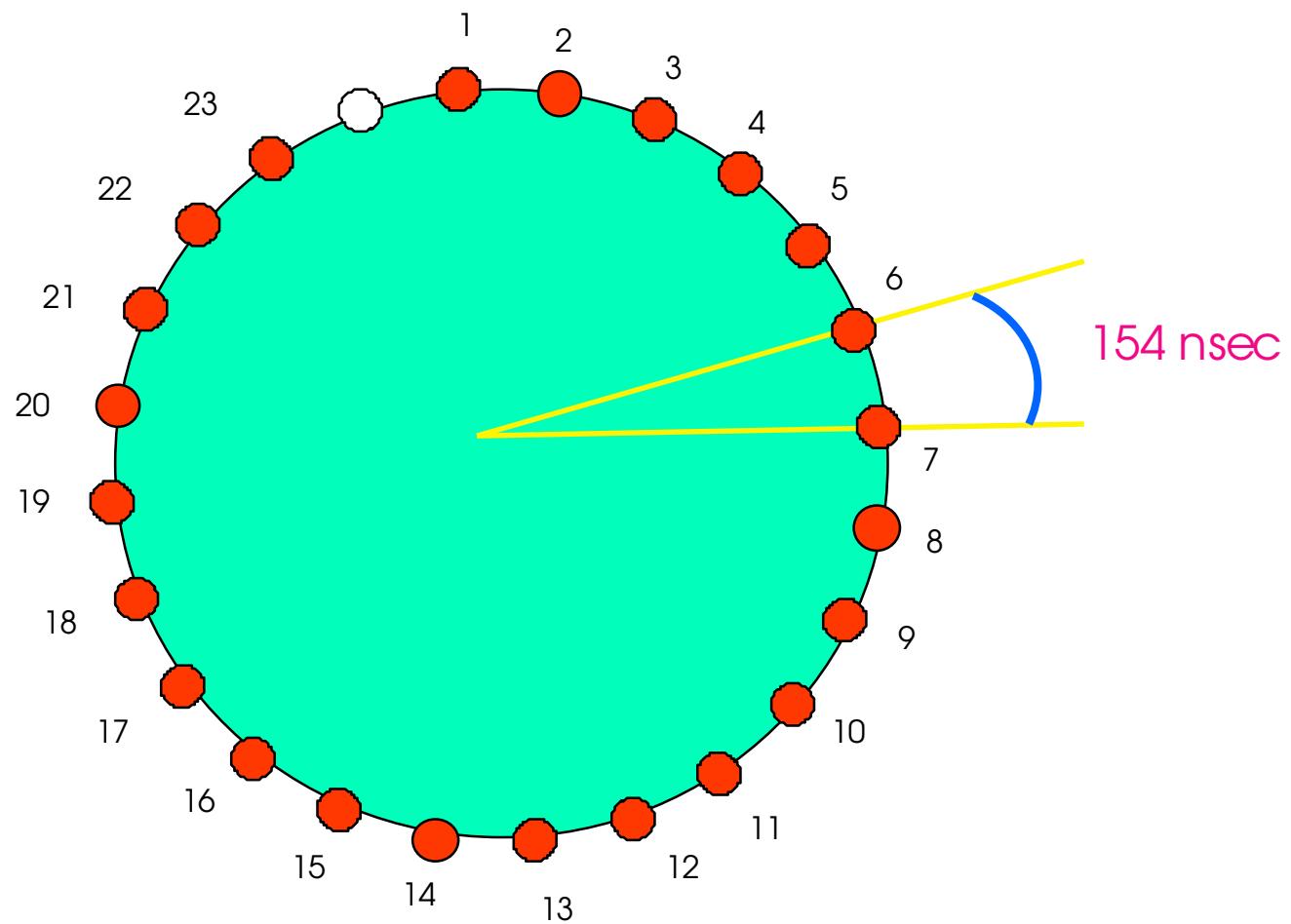
What do we need for the next phase?

- 10 m long straight section
- 3 mm internal gap, 6.5 mm minimum gap
 - for maximum undulator tunability,
 - or in-vacuum undulators with 4 mm gap
- clean bunches (purity $< 10^{-11}$)
- longer bunches (15 mA/bunch)
- lower emittance / top-up
- specialized undulators: a set of 8 undulators with different periods (2.7 and 1.6 cm)
- Or superconducting undulator
- Brilliance $\gg 10^{20}$, 6-30 keV

What can we deliver in return ?

- Phonon dynamics via NRIXS
 - Monolayers, buried layers, spin dynamics
 - Quantum dots
 - @ pressures exceeding 2 Mbar, 3000 K
 - Mössbauer microscope
 - Dilute systems to extend the applicability of the method
 - Applications in astrophysics, geophysics, biophysics, and condensed matter, materials physics
- Lattice dynamics via IXS with $\Delta E < 1 \text{ meV}$ @ 25 keV
 - Membrane proteins
 - Liquids
 - Samples under high pressure
 - Higher Z-samples
 - Low-q dynamics in glasses

Time structure @ APS



The Mössbauer isotopes

Isotope	Energy (eV)	Half-life (ns)	ΔE (neV)
• ^{181}Ta	6238.	9800.	0.067
• ^{169}Tm	8401	4.	114.0
• ^{83}Kr	9400.	147.	3.1
^{73}Ge	13263.	2953.	0.15
• ^{57}Fe	14413.	97.8	4.67
• ^{151}Eu	21532.	9.7	47.0
• ^{149}Sm	22490.	7.1	64.1
• ^{119}Sn	23870.	17.8	25.7
• ^{161}Dy	25655.	28.2	16.2
• ^{40}K	29560.	4.25	107.0

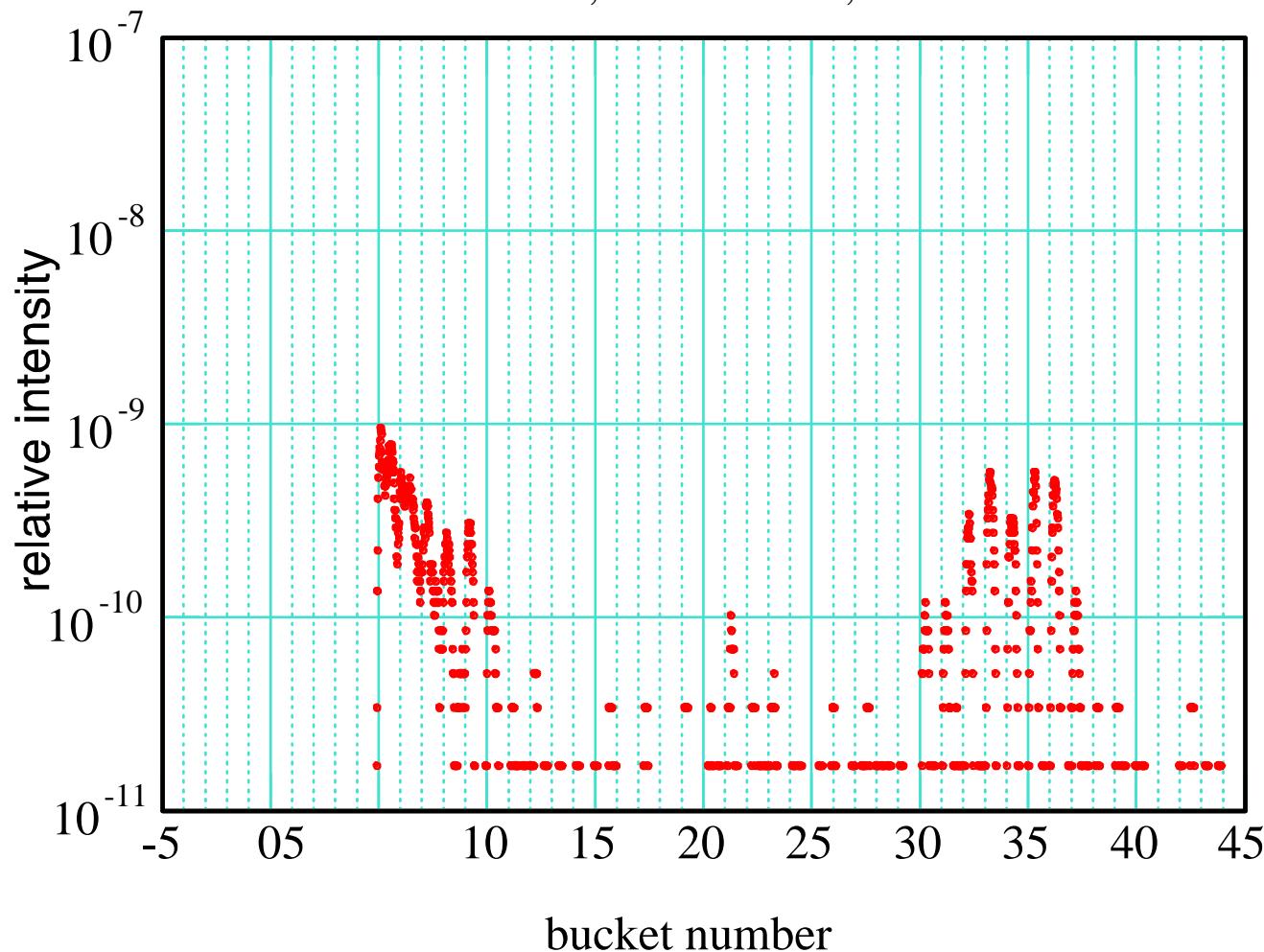
^{145}Nd	67100.	67.1	6.8
• ^{61}Ni	67400.	5.1	89.0
^{193}Ir	73000.	6.3	72.3
^{133}Cs	81000.	6.4	71.5
^{67}Zn	93300.	9200.	0.049

• Observed

Bunch Purity

APS bunch purity, March 02, fill 52

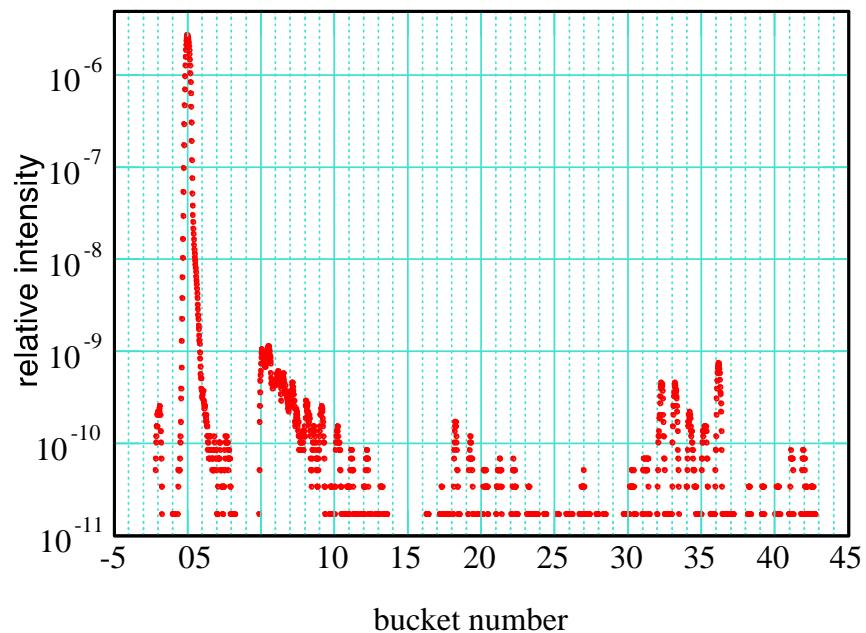
measured at 3-ID, APD detector, 1ns resolution



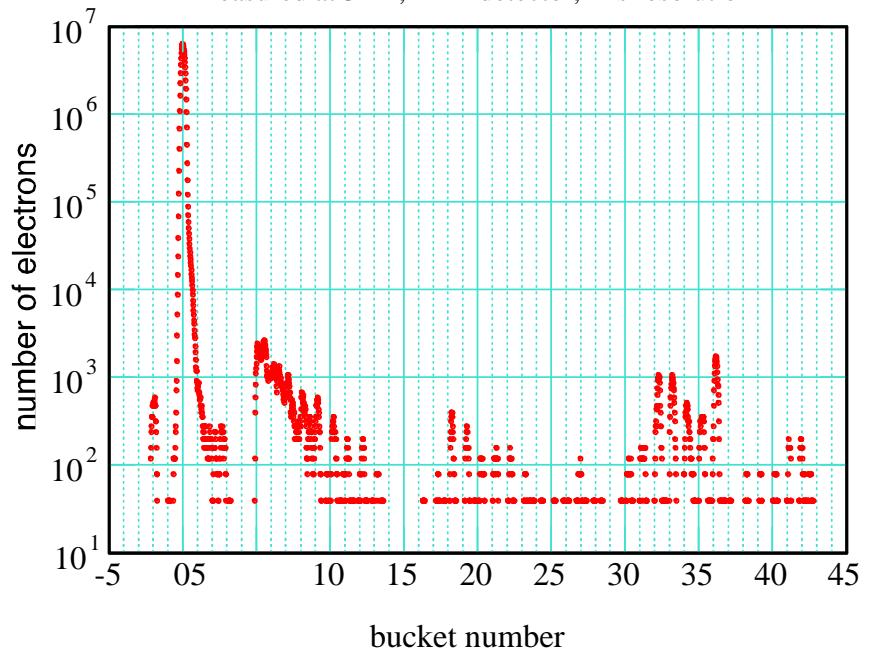
W. Sturhahn, March 03, 2001

How many electrons can we see ?

APS bunch purity, March 02, fill 51
measured at 3-ID, APD detector, 1ns resolution



APS bunch purity, March 02, fill 51
measured at 3-ID, APD detector, 1ns resolution



W. Sturhahn, March 03, 2001

Nuclear forward scattering in oxidation kinetics of clays

J. Amonette, et al, Pacific Northwest Laboratory

